# ScreenMaster
# Paperless data recorders



Securing your process data without the headache of paper charts.

## Measurement made easy

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**ScreenMaster SM500F
and RVG200 paperless
data recorders**

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## Introduction

These are changing times for industrial data. People's expectations of immediate access to information, plus an increasing need for detailed reporting to meet a growing raft of legislative and regulatory demands, has seen the proliferation of electronic data recording technology into virtually all industrial sectors.

Today's manufacturing environment is more highly regulated than ever. As several recent high profile product recalls show, even the best run companies cannot always rely on their quality assurance procedures to prevent problems that could expose them to legal action by regulators or customers. The need for some form of back-up in the event of a problem is therefore of paramount importance.

Although paper chart technology has served users well for decades, it has struggled to keep pace with the demands of tightening legislative requirements. Many companies simply file away their paper charts. If a problem arises then it can take personnel hours to find specific data. But electronic data can be stored, accessed and interrogated easily whenever required, enabling companies to harness the power of this data to boost efficiency, quality and process control.

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## The march to paperless recording

With recent developments in technology, paperless data recorders are found in a growing range of applications. The latest generation of devices allow precise variations in process data to be recorded and displayed in far greater detail than was previously possible with paper chart recorders. Foremost amongst these are an array of security features, plus a range of expanded possibilities for presentation, including the ability to create and print graphs and reports. Many suppliers can now also offer units which enable data to be downloaded into an Excel spreadsheet, allowing it to be interrogated in greater detail.

There are also now much greater opportunities for operators to 'drill down' into their recorded data. For example, particular events such as alarms or variations can now be automatically recorded together with the actual time they occurred, unlike paper chart recorders which relied on additional details being manually added to the chart by the operator.

Many electronic data recorders also now enable authorized operators to add an 'electronic signature' to recorded data to help in tracing who was involved in the process and any changes they may have made that might affect product quality.

The ability to store and archive large quantities of data is another significant benefit of paperless data recorders, particularly in industries where records are required to be retained for several years. Compared to the storage space and associated filing systems required for paper-based records, paperless data recorders provide a convenient, fast way of accessing historical process data. Today's paperless devices can store millions of samples of data in their on-board memory, which can then be archived to a memory card or transferred to a PC, or server storage.

Paperless data recorders can also offer a significantly reduced cost of ownership. The solid state construction of these recorders means there are no mechanical components that need to be checked, maintained or fail with the risk of lost data. There is also no need to replace consumable items such as charts or pens which can often outweigh the initial cost of a paper chart recorder throughout its operational life.

## Why is recording important?

For some industries such as food, pharmaceuticals, aerospace and healthcare, data acquisition and traceability is a legislative requirement designed to deliver demonstrably safe products.

For example, any manufacturer of consumer goods in the European Union has to comply with European Directive 2001/95/EC, which is implemented in the UK through the General Product Safety Regulations 2005. Everything is covered, from cooking pans and clothes to jet skis, toys and electrical appliances. For the first time, these safety regulations explicitly recognize the importance of working to accepted technical standards in order to produce safe products. In effect, products that comply with the relevant CEN, CENELEC or ETSI standards are deemed to be safe.

For others, it's a way of demonstrating that they comply with relevant industry standards. The Environmental Permitting Regulations (EPR), for example, obliges operators of utilities and industrial processes to collect data on their emissions to both air and water, in order to ensure that these are maintained within stipulated limits. By enabling accurate data to be presented in a variety of formats, today's paperless data recorders have proven ideal for users when compiling reports for the Environment Agency and other organizations.

Process data can also hold the key to greater efficiency by enabling companies to apply productivity-boosting techniques such as predictive maintenance and statistical process control. Very high-volume industries such as refining and petrochemicals have tended to adopt these advanced techniques, because a marginal increase in efficiency can have an enormous impact on profits.



**Accurate recording of emissions data is becoming increasingly important to meet stringent environmental reporting requirements**

## What are the key requirements for a data recorder?

The demands on a recording device vary according to the process in which it is being used. However, the main similarity between all processes where recorders are used is the need to collect and analyze data to show that products were manufactured in accordance with specific requirements such as time or temperature.

The Aerospace Material Specifications (AMS) 2750 standard, for example, sets down the criteria for the heat treatment of materials in aerospace manufacturing processes.

Increasingly being adopted by the automotive industry, the standard stipulates detailed requirements for temperature measurement and monitoring in heat treatment processes. Compliance with the standard is essential in order to prove that components can be safely manufactured to a set quality during production.

Factors that must be checked to ensure compliance include temperature uniformity throughout the heat treatment plant, the types of measurement and control instruments that can be used and the inspection frequency of temperature sensors and overall system efficiency.

Similarly stringent requirements also apply in the medical and pharmaceutical worlds. The Medicines and Healthcare Products Regulatory agency (MHRA), for example, sets down strict measures for monitoring and maintaining cold storage facilities in UK hospitals and medical establishments. Medicinal products require controlled storage and transit conditions in order to ensure that their quality is not compromised. This applies to low-risk products as well as high-risk products such as vaccines, insulins and blood products (such as Factor VIII), which normally require storage between 2 and 8 °C (36 and 46 °F). All designated blood bank fridges must also meet the appropriate standards and all hospitals can be subject to an MHRA audit, to ensure they comply.

To meet the MHRA requirements, those involved in the distribution of drug products and storage of blood and other products are required to record storage and transportation temperatures, as well as being licensed by the appropriate authorities. Temperature monitoring devices should be used to demonstrate compliance with the records that are kept.



**Data recorders can help prove compliance with cold storage standards in medical applications**

When choosing to use a Paperless data recording system in these applications you must take into account the system's compliance with the FDA's (Food & Drug administration) 21 CFR part 11 regulation, which governs the use of electronic data record keeping for pharmaceutical, food & Beverage and cosmetic related applications (not limited purely to production, but also storage and marketing of those products). This regulation focuses on the requirement to ensure that the creation and storage of electronic records is secure and that at no point in the process of recording, reviewing and storing the data it can be accessed by unauthorized personnel and/or manipulated or tampered with. They also specify that access to the system and any data taken by that system should be strictly controlled and recorded by way of Internal audit trail and system security configurations.

By providing traceability of all events during the production process and demonstrating compliance with any legislation and/or regulations governing production, recorders can help to serve as potential insurance in the event of a product failure.

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## How has the technology changed?

A key benefit of the new generation of electronic data recording devices is the incorporation of modern communications and software technology. ABB's ScreenMaster series recorders and other state-of-the-art devices have the ability to communicate via Ethernet and transfer information using the file transfer protocol (FTP) standard. Software effectively turns the recorder into something that appears to the network to be a hard disk, in the same way as people plug MP3 players into their PCs at home.

Recorder manufacturers usually provide a software utility that transfers data from the recorders and deposits it elsewhere on the network at regular, user-defined intervals. In the case of ABB's DataManager Pro, the software is sited on the network and 'pulls' the data off the recorders.

Electronic data is typically stored in at least three places: on the recorder's internal memory, on an on-board memory card and on the network. In addition, most IT departments regularly back up all the drives on their network, so electronic data is generally backed up on tape too. This is infinitely both more secure and flexible than a single paper-based record, particularly for global companies which may need to access data from multiple production sites.

Electronic recorders will also show exact measurements that can be hard to obtain from a paper recorder, due to the thickness of the line and rounding up of readings. Results can also be affected by the humidity of the atmosphere which can alter the paper's properties.
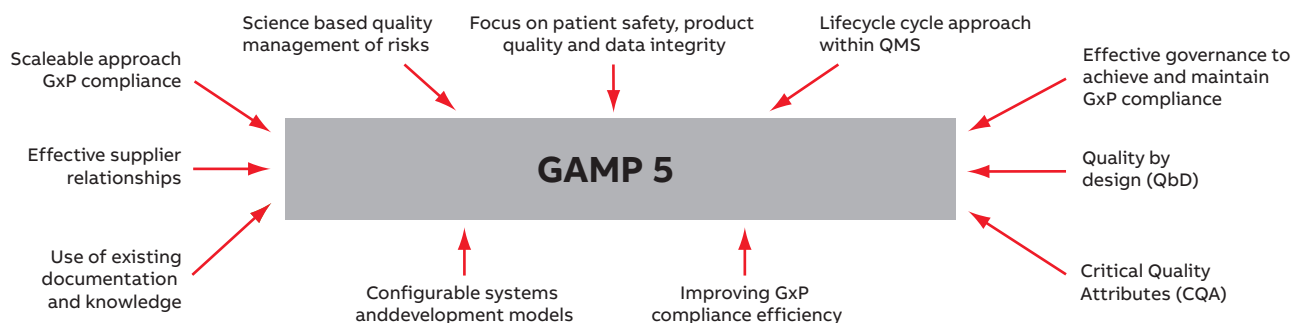


**GAMP 5 sets the main requirements for the use of computerized systems in pharmaceutical applications**

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## Key features and benefits of the ScreenMaster range

### Security

While the ability to manipulate and visualize data is important, the need to ensure that devices provide the maximum protection against unauthorized tampering is of paramount importance in many industries. One example is the pharmaceutical sector. The international society of Pharmaceutical Engineers (ISPE) publish the Good Automated Manufacturing Practise (GAMP) guide to risk-based approach of computerized GxP systems. Currently at revision 5, this guide focuses on how best to validate a complete computerized system as is required by the FDA's 'predicate' rules – the rules devised to cover the production techniques and controls that must be used for the manufacture of Pharmaceutical, Food & Beverage and Cosmetic products. The GAMP guide offers a set of guidelines on how best to achieve validation of a system and focus on building the production quality into the system from conception through to the end of the system's life. The diagram below shows the key drivers associated with the current GAMP 5 guidelines.

The USA has led the way in developing regulations for the control of production of pharmaceutical products. The FDA's Code of federal regulations 21 (21 CFR) has been adopted worldwide and the orange guide was produced in Europe as a result of these regulations.

If a a pharmaceutical company exports products to the United States, it must comply with the FDA's rules (21 CFR). If that company chooses to use a 'computerized system' (non paper recording and record keeping) that company must also comply with 21 CFR part 11 as well as all other 21 CFR regulations pertaining to their product; this is where GAMP comes into play as the 'predicate rules' pertaining to production and process state that system validation is a requirement. While the validation requirements of the regulations focus on the system as a whole, most data recorder manufacturers take steps to ensure that their recorders are compliant within a well designed gathering and storage system. For example, ABB's ScreenMaster recorders store digital signatures along with data files, so that any file tampering can be spotted immediately. This function is accompanied by an extensive range of other security measures, which are covered in more depth in the next section of this document.

## Intuitive user interface

All operation of the ScreenMaster is done via Windows-style menus and dialogs that effortlessly guide the operator through the functions they require.

A channel-by-channel approach to the configuration layout ensures simple and fast setup. The SM500F also features detailed on-line help facilities, further simplifying setup and operation.

## Thriving in real process conditions

Uniquely for a product of this type, the ScreenMaster series has a protection rating of NEMA 4X & IP66; for the SM500F this applies to the entire instrument. This enables it to be installed, without additional protection, in applications that require frequent hose-down.

## Flexible recording capability

A wide range of features give ScreenMaster recorders the flexibility to meet the requirements of almost any recording application.

Flow totalizers enable instantaneous flow rates to be totalized and recorded. An automatic reset capability enables reports of daily, weekly, monthly flow volumes to be generated or alarms to be raised if predefined flow limits for a given time period are exceeded.

Mathematical functions such as averages and deviations can be calculated using ScreenMaster's math and logic option. Results of math calculations can be displayed, recorded and used to drive alarms and totalizers.

For batch processes, the ScreenMaster batch recording option allows data including batch numbers and product type information to be recorded alongside process data. With ABB's DataManager Pro software, collected batch records can be rapidly displayed by searching for their batch number or batches with common attributes identified.

## A clear view of your process

Multiple display formats, including strip chart, bar graph, digital indictor and process displays, provide a clear view of process information.

## Guaranteed data security

The recorder's internal flash memory that is used to store process data and configuration details does not rely on battery backup to retain process data during power failures.

Multiple users can be configured, each with individual user name, password and access rights, to the recorder.

A comprehensive audit log records configuration changes, calibration changes, system events and many other items key to ensure data integrity. Where applicable, all entries are detailed with operator identification.

A media door lock is available to ensure the security of the memory card. Compliant to 21 CFR Part 11 comes as standard, as does the ability to make the electronics tamper proof.



**All operation of the ScreenMaster is done via Windows-style menus**

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## …Key features and benefits of the ScreenMaster range

### Ethernet communications

It is very simple to connect a ScreenMaster recorder to an existing plant network via Ethernet communications. Once connected, remote process monitoring, access to archived data and email facilities become instantly available. Via the use of modem router or GSM technologies the ScreenMaster's labour saving Ethernet features can still be used when a recorder is in a remote location.

### Remote process monitoring

Remote access to a ScreenMaster is possible using a standard web browser (for example, Internet Explorer or Google Chrome). Detailed real-time information is available for current alarm and totalizer conditions, memory card status and many other key process details.

### Email notification

Any Ethernet equipped ScreenMaster recorder is capable of sending email notification of important events via a network SMTP server. Emails can be triggered from process alarms or other key events and can be sent to multiple recipients. Detailed process reports can also be emailed at scheduled times.

### Automatic data file collection

All process data files created by a ScreenMaster recorder can be accessed remotely via its Ethernet connection. Using ABB's DataManager Pro software it is possible to automatically collect data files from any number of records.

### Modbus

Via the use of MODBUS TCP protocol, as client or server, a ScreenMaster recorder can communicate the process values being monitored to a DCS, SCADA, PLC or other similar system.

### Validation

ABB offers GAMP validation templates for all the ScreenMaster series of paperless recorders, compliant with GAMP5 guidelines, that will follow the unit's life through delivery, calibration, production and can even extend to its end-of-life disposal.

ABB can offer a range of validation documentation services in accordance with the required application, such as instrument configuration sheets to help document the User Requirement Specification (URS) and aid the production of the Functional Specification (FS), as well as Installation Qualification (IQ) and Operational Qualification (OQ) documentation.

## DataManager Pro

Analysis of process data archived by a ScreenMaster recorder can be performed easily using ABB's DataManager Pro software, which features a stand-alone operating platform offering a wealth of powerful features for interrogating and presenting recorded data.

Operators of the DataManager Pro software can collect data from multiple recorders, either manually from their memory cards or automatically via a network, which can also include recorders located worldwide.

Users of ABB's ScreenMaster recorders are now able to drill deeper into their recorded data. Functions include the ability to compile graphical charts from the data, which show a range of different parameters that can be readily compared and contrasted. Using the new chart template function, operators can now create templates for specific channels, which can be easily reused to enable consistent presentation of process conditions between production runs. This function can be used both for single recorders and for groups of recorders, ideal where multiple units are used to collect data on a number of identical processes.

Another key feature is the inclusion of a dual cursor function. Using this function, operators can now access process statistics for specific periods of time, enabling them to view recorded data for each device in the selected chart. To enable operators to discover whether the process is within required limits, DataManager Pro includes a 'marker' function, which can be activated in the chart statistics view to show the normal conditions for the process.

For operators tasked with producing reports for compliance or product quality purposes, a major benefit of DataManager Pro is its range of presentation possibilities. All collected data can be presented easily in a graph together with accompanying tables and statistics. Data can also be annotated to highlight specific events such as alarms, with information able to be added on when and why they occurred.

For batch operators, there is also now a batch data export and chart file wrapped up in a single file (chart package), which can be emailed to an end customer for review.

A further feature created for contract batch service providers is the availability of a limited functionality version available for unlicensed users. This version can be given by the contract companies to their customers to allow them to view the batch data for themselves and as proof of compliance for traceability purposes, simply by downloading the viewing package from the ABB website.
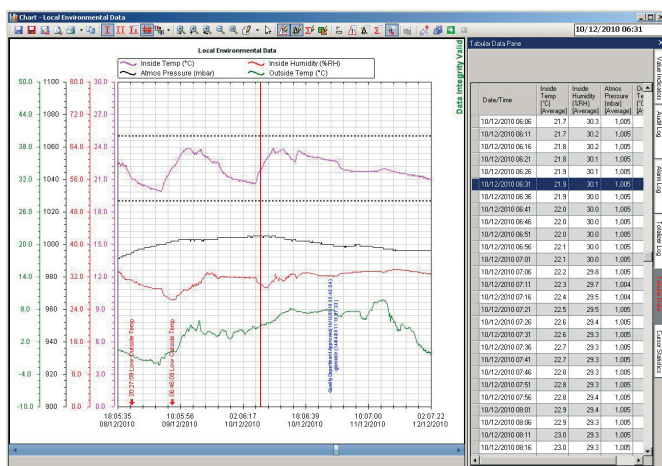


**DataManager Pro offers a range of presentation possibilities**

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# The technology

The ScreenMaster paperless recorder series provides solutions for electronic data recording and analysis. Features include a fully solid state design, clear operator displays and an intuitive user interface. Ethernet communications allows wide access to process information and historical data while high specification security features ensure the security of data.

## SM500F field mountable paperless recorder

The world's first field mountable paperless recorder can be used anywhere, anyhow and by anyone. The SM500F is a 12-channel recorder with seven analog inputs that can be installed even in the most hostile environments. It takes recording out of the control room and offers local access to operational data.

A choice of panel, pipe and wall mounting options means that the SM500F can be installed in virtually any location. The wall mounted version in particular can help to significantly reduce installation costs, by eliminating the need for additional enclosures.

The SM500F helps users protect their operation critical activities, while providing reduced cost of ownership compared to paper chart recorders. To reduce cost even further, the SM500F is also available in a monochrome version.



**SM500F – the worlds first field-mountable paperless recorder**

## RVG200 paperless recorder

The ScreenMaster RVG200 is a secure, easy-to-use paperless recorder. Up to 24 process signals can be connected directly to the RVG200's analog inputs or transferred to it via digital communications. All processed data, including alarm conditions, maths calculation results and totalizer values, are displayed clearly to the operator and archived securely in an encrypted format for review using the accompanying DataManager Pro PC software.

A touchscreen featuring swipe gesture control provides fast and intuitive operation. USB ports further simplify operation by enabling peripherals (for example a keyboard, mouse or barcode scanner) to be attached.



**The RVG200 paperless recorder**

## Product selection guide

Standard ✔
Optional ●

| Model | SM500F | RVG200 | SM3000 |
|---|---|---|---|
| **General features** | | | |
| Display | 120 mm (4.7 in.) TFT Mono STN or 140 mm (5.7 in.) TFT | 144 mm (5.7 in.) TFT | 310 mm (12.1 in.) TFT |
| Operator interface | Tactile keys | Touchscreen | Tactile keys |
| Internal memory | 64Mb Flash | 256Mb Flash | 8Mb Flash |
| Memory card | SD | SD, USB, Internal | Compact Flash |
| Number of software recording channels | 12 | 24 | 36 |
| Process groups | 2 | 6 | 6 |
| **Process inputs** | | | |
| Universal analog/digital inputs | 1 to 7 | 24 | Up to 36 |
| 2 wire transmitter power supply | 2 loops optional | 12 loops optional | 2 loops standard, 8 optional |
| **Additional I/O** | | | |
| Relays | 1 standard, 2 optional | 1 standard, 12 optional | 24 optional |
| Digital inputs | | 10 optional | 24 optional |
| Digital outputs | | 12 optional | 24 optional |
| Analog outputs | | 12 optional | 8 optional |
| MODBUS RS485 | ● | ● | ● |
| 10BaseT Ethernet | ● | ✔ | ✔ |
| **Advanced processing** | | | |
| Alarms | 4 per channel | 4 per channel | 4 per channel |
| 21 CFR Part 11 compliant security | ✔ | ✔ | ✔ |
| Totalizers | 24 optional | 48 optional | 72 standard |
| Advanced math/logic | ● | ● | ● |
| Batch recording | ● | ● | ● |
| **Physical attributes** | | | |
| IP Rating | NEMA 4X & IP66 | NEMA 4X & IP66 | NEMA 4X & IP66 |
| Panel cut out | 138 x 138 mm (5.43 x 5.43 in.) | 138 x 138 mm (5.43 x 5.43 in.) | 281 x 281 mm (11.06 x 11.06 in.) |
| Power supply | 85 to 265 V AC or 10 to 36 V DC | 100 to 240 V AC or 24 V DC | 85 to 265 V AC or 24 ±2.4 V DC |
| Overall size | 144 x 144 x 79 mm (5.67 x 5.67 x 3.1 in.) | 144 x144 x 117 mm (5.67 x 5.67 x 5.8 in.) | 288 x 288 x 245 mm (11.34 x 11.34 x 10 in.) |
| Mounting options | Panel, wall or pipe | Panel | Panel |

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